Host preferences of Paropsini (Coleoptera: Chrysomelidae) in south-western Australia

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Abstract

The paropsine beetles *Chrysophtharta debilis* and *Paropsis elytrura* respectively showed distinct preferences for a Symphomyrtus species of Eucalyptus, *E. rudis*, and a Corymbia species, *E. calophylla*. Female beetles of both species laid more eggs on their preferred host and, while larvae of both species matured more rapidly on *E. rudis*, *C. debilis* did so faster than *P. elytrura*. *Eucalyptus marginata* was a poor host in terms of female oviposition and larval survival.

Introduction

Eucalypts in Australia are attacked by a wide range of leaf-eating insects, including phasmatids (Shephard 1957), sawflies (Carne 1965) and Lepidoptera (Campbell 1962). Indigenous paropsine beetles and their larvae are also prominent defoliators of eucalypts (Carne 1966), but are normally present at low or moderate population levels. Outbreaks have occurred, however, leading to defoliation over extensive areas and loss of growth in individual trees (Greaves 1966). The species *Paropsis charybdis* Stal has also caused serious damage to eucalypt plantations in New Zealand (Carne 1966).

Published biological information concerning paropsines is limited to species from eastern Australia (Cumpston 1939, Carne 1966, Tanton & Elipa 1978) and Tasmania (de Little 1979, Kile 1974). There are no published papers on paropsines from Western Australia, despite the fauna being rich in species. Two of the most widely distributed and locally abundant paropsines are *Chrysophtharta debilis* Chapius and *Paropsis elytrura* Blackburn. These species are found alone on small trees and coppice, or in association with other species of paropsines. Both species have also been observed damaging planted eucalypts on road verges and farm trees (G Hall, unpublished observations)

This paper describes a laboratory trial designed to quantify observed field preferences for host trees. The two species here selected have similar behaviour and distribution as other paropsines in southwestern Australia.

Methods

Study area

Studies were carried out at Helena Valley, 30 km east of Perth. The study area supported 1-3 m tall regrowth stands of *Eucalyptus calophylla* R.Br. ex Lindley (Corymbia), *Eucalyptus marginata* Donn ex. Smith (Monocalyptus) and *Eucalyptus rudis* Endl. (Symphomyrtus).

Oviposition preference

Two pairs each of adult *C. debilis* and *P. elytrura* were randomly selected from a culture stock and placed in separate plastic boxes (18 x 12 x 4 cm), and maintained at 23°C and 14 hours photophase. Matched cut shoots of *E. calophylla*, *E. marginata* and *E. rudis* were placed in water-filled, stoppered glass vials and a shoot of each species placed in each box. Shoots were replaced every 2-3 days. Numbers of eggs laid on the shoots by each species were tallied over 6 weeks. At the end of the trial all beetles remained alive.

Feeding trial

Thirty cultures each consisting of 20 larvae were established in plastic rearing boxes (18 x 12 x 4 cm) such that there were five replicates of each beetle species on each eucalypt species. Cultures were established from day-old larvae which had consumed their egg shells, and were maintained at 23°C and 14 hours photophase. Every 2-3 days surviving larvae were transferred to clean boxes containing fresh, young foliage. The foliage was taken from a few trees, selected for phenotypic similarity. The shoots were matched for uniformity of size and leaf texture. When mature, the larvae dropped to the floor of the box, and were weighed within 24 hours.

Results

Oviposition preference

The total number of eggs laid by both species on each host is shown in Table 1. Chi-square analysis shows that the data are heterogeneous ($P<0.001$), indicating an ovipositional preference of *C. debilis* for *E. rudis* and *P. elytrura* for *E. calophylla*. Both species oviposited least on E. marginata.

Feeding trial

Both species survived poorly on *E. marginata*, with only one *P. elytrura* larva surviving to maturity. This host species was therefore omitted from the statistical analysis. Larvae of both species survived to maturity on *E. calophylla* and *E. rudis* (Table 2). *C. debilis* showed a significantly better survival ($P<0.001$) on *E. rudis*, whereas *P. elytrura* survived best on *E. calophylla*.

Table 1

Number of eggs desposited by two females each of *C. debilis* and *P. elytrura* on shoots of *E. calophylla*, *E. marginata* and *E. rudis* in the laboratory over a six week period.

Species	E. calophylla	E. marginata	E. rudis
C. debilis	182	50	908
P. elytrura	1344	160	772

Table 2

Comparison of survival, duration and final weights of *C. debilis* and *P. elytrura* larvae reared on the foliage of different eucalypt hosts.

	E. calophylla	E. marginata	E. rudis	Sig.[2]
	% Survival ± SE[1]			
C. debilis	17 ± 9.8	0	78 ± 6.9	***
P. elytrura	84 ± 4.8	1 ± 1	17 ± 4.6	***
	Mean duration of larval stage (days) ± SE			
C. debilis	17.7 ± 0.9	—	14.0 ± 0.2	*
P. elytrura	23.9 ± 0.1	20	22.5 ± 1.0	NS
	Mean mass (mg) ± SE			
C. debilis	50.1 ± 1.6	—	50.0 ± 0.9	NS
P. elytrura	157.4 ± 4.2	131.5	113.4 ± 9.4	*

[1]Means of five replicates
[2]Only relates to comparison between *E. calophylla* and *E. rudis*: ***P<0.001, *P<0.05

Larvae of both species developed fastest on *E. rudis*, with the *C. debilis* - *E. rudis* combination being the most rapid. Mature larvae of *P. elytrura* achieved a greater mass on *E. calophylla* (P<0.05) than on *E. rudis*, whereas the weight of *C. debilis* larvae was similar between these two hosts.

Discussion

Of the most common species of paropsines occurring in mixed associations, *C. debilis* and *P. elytrura* respectively showed distinct host preferences to the Symphomyrtus species, *E. rudis*, and to the Corymbia species, *E. calophylla*. These results are in agreement with Burdon and Chilvers (1974) and de Little and Madden's (1975) findings that various paropsines show preferences for particular Eucalyptus subgenera. The current data are first report of a paropsine preferring a Corymbia species.

Females of *C. debilis* and *P. elytrura* showed an ovipositional host preference, indicating their role in the selection of preferred hosts. The larvae of both species survived better and grew larger on the host that the females preferentially selected.

This study has shown that *E. marginata* is a poor host for paropsines. Both beetle species laid fewer eggs on *E. marginata* and only one of 200 larvae survived to maturity. This result agrees with Majer and Recher (1988) who reported that *E. marginata* had a significantly lower invertebrate population than *E. calophylla* or *E. wandoo*.

The potential for population outbreaks of *C. debilis* and *P. elytrura* in south-western Australia appears low due to the eucalypt hosts occurring in mixed stands, even after logging. This contrasts with the situation in Tasmania where the preferred Monocalyptus host of *Chrysophtharta bimaculata* (Olivier) forms pure regrowth stands in which severe outbreaks occur (de Little & Madden 1975).

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